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XIV.—*Key to the Isopods of the Pacific Coast of North America, with Descriptions of Twenty-two new Species.* By HARRIET RICHARDSON*.

THE Isopods of the Pacific coast of North America have claimed the attention of a number of naturalists during the last half of the nineteenth century. Among the first to contribute to the knowledge of the fauna of that region was Dana. Stimpson also belongs to the earlier part of that period; his work on the Crustacea and Echinodermata of the Pacific shores of North America, published in 1857, was the first special treatise on the forms of that locality. In connexion with the work of the later part of the past fifty years, the names of Stuxberg, Lockington, and Harford form one group as contemporaneous workers (1875-76), those of Schiödte and Meinert and Budde-Lund another group (1883-85), while the publications of Dr. Hansen and Dr. Benedict represent the latest (1898) work on the Isopods of that coast.

The number of species already described is 75, and 22 are added in the present paper. These species represent 44 genera and 16 families †.

The author has used Dr. Benedict's keys for the genera *Synidotea* and *Arcturus*, and is indebted to Professor Sars for

* From a separate copy from the 'Proceedings of the United States National Museum,' vol. xxi. pp. 815-869 (1899).

† [The index-list of tribes &c. is here omitted.]

many suggestions obtained from his excellent work on the Crustacea of Norway. In many places his synopses of the families and genera have been used in entirety. Other authors have been most helpful: Hansen on the Cirrolanidæ; Schiödte and Meinert on the Cymothoidæ; Budde-Lund on the Oniscidæ; and others, to whose works specific references are made.

The present paper is based on material contained in the U.S. National Museum.

Analytical Key to Tribes or Superfamilies of Pacific Coast Isopoda.*

- | | |
|---|-------------------|
| a. Legs of first pair cheliform. Uropoda terminal. Pleopoda, when distinctly developed, exclusively natatory | I. Chelifera. |
| a'. Legs of first pair not cheliform. | |
| b. Uropoda lateral. | |
| c. Uropoda forming together with the terminal segment of the metasome a caudal fan. Pleopoda for the most part natatory | II. Flabellifera. |
| c'. Uropoda valve-like, inflexed, arching over the pleopoda, which to a great extent are branchial | III. Valvifera. |
| b'. Uropoda terminal. | |
| c. Free forms. | |
| d. Pleopoda exclusively branchial, generally covered by a thin opercular plate (the modified first pair) | IV. Asellota. |
| d'. Pleopoda fitted for air-breathing | V. Oniscoidea. |
| c'. Parasitic forms | VI. Epicaridea. |

I. CHELIFERA.

Family I. Tanaidæ.

Body scarcely attenuated behind. Mandibles without palp. Coxal plates inconspicuous. Superior antennæ with one multiarticulate flagellum. Anterior maxillæ with only a single masticatory lobe; posterior ones quite rudimentary. Second pair of legs ambulatory in character. Epignath of maxillipeds narrow, falciform.

1. TANAIIS, Audouin & Milne-Edwards.

Antennæ short, subequal. Pleon five-jointed; fourth joint short; fifth joint terminated by a pair of single branched filamentary uropoda. Only three pairs of pleopoda. Palp of anterior maxillæ biarticulate. Eyes well developed. Superior antennæ three-articulate, with small terminal flagellum.

* Sars's analytic key has been used with slight modifications. Sars's 'An Account of the Crustacea of Norway,' II., Isopoda (1896), pts. i., ii. p. 3.

Analytical Key to the Species of *Tanais*.

- a. Inferior antennæ scarcely half the length of superior antennæ. Pereiopoda having the first three joints short and broad, affixed to sides of pereion like plates of mail. 1. *T. loricatus*, Spence Bate.
- a'. Inferior and superior antennæ of nearly equal length. Pereiopoda with joints not dilated, slender 2. *T. alascensis*, sp. n.

1. *Tanais loricatus*, Spence Bate.

Tanais loricatus, Spence Bate, Lord's Naturalist in British Columbia, ii. (1866), p. 282.

Hab. Esquimault Harbour, British Columbia.

2. *Tanais alascensis*, sp. n.

Body three and a half times longer than broad.

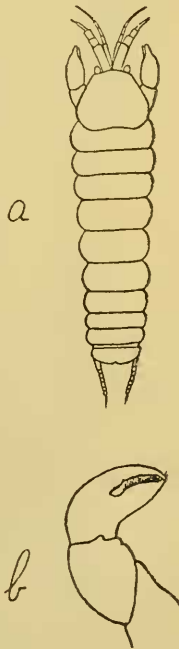
Head large, narrowed anteriorly. Frontal margin almost straight. First pair of antennæ short, stout, consisting of four joints, the first joint being the longest. Second pair of antennæ more slender, a little longer, consisting of four joints, the first joint being longest, and a rudimentary flagellum. Eyes small and pedunculated.

The first segment of the thorax is confluent with the head. The second, third, fourth, and fifth segments increase slightly in length; the fifth and sixth are about equal; the seventh is not quite so long as the preceding one.

The abdomen is composed of five segments, the first three of which are subequal; the fourth is short, about half as long as any of the others and also narrower; the terminal segment is as long as the two preceding ones together, and is rounded posteriorly, with a slight median notch. The segments of the abdomen decrease in width gradually from the first to the terminal segment. The terminal filaments are seven-jointed and single-branched, and are furnished at their extremities with a few long hairs.

The first pair of legs are stout and chelate; the propodus is produced into a

Fig. 1.



Tanais alascensis, sp. n.

× 8. a, dorsal view; b, last two joints of leg of the first pair.

strong immovable finger, irregular in shape, having its central portion raised and truncate on its upper surface, which is distinctly serrate. The dactylus is likewise serrate on its inner surface. The other legs are slender, with a gradual increase in stoutness.

Colour brown, marked in some specimens with a darker brown, and having oval patches of the darker colour on the head.

Kyska Harbour, Alaska; Mr. W. H. Dall collector; depth 6 to 8 fathoms.

Type. No. 22563, U.S. N. M.

II. FLABELLIFERA.

Analytical Key to the Families of Flabellifera.

- a. Pleon consisting of six segments.
- b. Uropoda with one of the branches almost obsolete or rudimentary, not lamelliform. II. LIMNORIIDÆ.
- b'. Uropoda with both branches developed; mostly lamelliform.
- c.* Maxillipeds with the palp free, the margins of the last two joints more or less setose, never furnished with hooks.
- d. Mandibles with the rather broad, more or less tridentate cutting-edges meeting squarely behind the large upper lip; the secondary plate and peculiar equivalent for the molar well developed. First maxillæ having the plate of the first joint armed with three spines, that of the third with many. Second maxillæ of moderate size, the three free plates very setose. Maxillipeds with the palp rather broad, very setose. III. CIROLANIDÆ.
- d'. Mandibles with the distal part produced into a long prominent process, the pair much overlapping; the secondary plate and molar evanescent. First maxillæ having the plate of the first joint unarmed, of the third carrying one very long spine. Second maxillæ small and feeble, the free plates almost rudimentary, with few setæ. Maxillipeds with the palp narrowed, not very setose IV. CORALLANIDÆ.
- c'. Maxillipeds with the palp embracing the cone formed by the distal parts of the

* The four points following *b'* are taken from Hansen's analytic key of the Cirolanidæ (Vidensk. Selsk. Skr. 6th ser., natur. og math. Afd. v. 1890, p. 317), as translated by Stebbing, *Hist. of Crust.* 1893, pp. 340, 341.

mouth-organs, the inner upper margin and apex never setose, the apex and sometimes the inner upper margin, at least in the males and females without eggs, being furnished with outward curved hooks.

d. Mandibles with the secondary plate very often visible; palp with no inflated joint. Maxillipeds commonly seven-jointed, sometimes four-jointed, the last joint in the latter case rather short, obtuse. Antennæ* long, unequal, with well-defined peduncle and flagellum

V. ÆGIDÆ.

d'. Mandibles with no secondary plate; the palp in adults with first joint or both first and second joints inflated. Maxillipeds always four-jointed, last joint rather long and narrow, subacute. Antennæ* much reduced, without clear distinction between peduncle and flagellum

VI. CYMOTHOIDÆ.

a'. Pleon consisting of less than six segments.

b. Pleon with two segments. Uropoda with one branch fixed; immovable

VII. SPHÆROMIDÆ.

b'. Pleon with four segments. Uropoda with both branches movable

VIII. SEROLIDÆ.

Family II. *Limnoriidæ*.

2. *LIMNORIA*, Leach.

3. *Limnoria lignorum* (Rathke).

Cymothoa lignorum, Rathke, Skrivt. af Naturh. Selsk. v. 1799, p. 101, pl. iii. fig. 14 (White).

Limnoria tenebrans, Leach, Ed. Encycl. vii. 1813, p. 433 (Am. ed. p. 273); Trans. Linn. Soc. xi. 1815, p. 371; Dict. Sci. Nat. xii. 1818, p. 353; Desmarest, Consid. Crust. 1825, p. 312; Latreille, Règne Anim. iv. 1829, p. 135; Edwards, Annot. de Lamarck, v. 1838, p. 276; Hist. Nat. des Crust. iii. 1840, p. 145; Règne Anim., Crust. 1849, p. 197, pl. lxxvii. fig. 5; Gould, Invert. Mass. 1840, pp. 338-354; Verrill, Proc. Am. Assoc. 1873 (1874), p. 367.

Limnoria lignorum, White, Pop. Hist. Brit. Crust. 1857, p. 227, pl. xii. fig. 5; Bate, Rep. Brit. Assoc. 1860 (1861), p. 225; Bate & Westwood, Brit. Sess. Crust. ii. 1868, p. 351; Norman, Rep. Brit. Assoc. 1868 (1869), p. 288; Verrill, Am. Journ. Sci. 3rd ser., vii. 1874, pp. 133, 135; Proc. Am. Assoc. 1873 (1874), p. 371; Report U.S. Commissioner of Fish and Fisheries, 1874, pt. i. p. 379 (85); Harger, Report U.S. Commissioner of Fish and Fisheries, 1874, pt. i. p. 571 (277), pl. vi. fig. 25; Proc. U.S. Nat. Mus. ii. 1879, p. 161; Stebbing, Trans. Devon. Assoc. 1874, p. 8; Ann. & Mag. Nat. Hist. ser. 4, xvii. 1876, p. 79; Smith, Proc. U.S. Nat. Mus. ii. 1879 (1880), p. 232, fig. 2.

* Inserted by author.

Limnoria uncinata, Heller, Verh. k. k. zool.-bot. Ges. Wien, xvi. 1866, p. 734.

Limnoria lignorum, Harger, Report U.S. Commissioner of Fish and Fisheries, 1878, pt. iv. pp. 373, 376. (See Harger for further synonymy.)

Limnoria californica, Hewston, Proc. Cal. Acad. Sci. v. 1874, p. 24 (nomen nudum).

Hab. Pacific Ocean; Bering Island. Also found on east coast of North America from Florida to Halifax, on the coast of Great Britain, and in the North Sea. Specimens from San Diego, California, collected by Mr. Henry Hemphill and labelled "*Limnoria californica*, Hewston," are in the National Museum.

Family III. Cirolanidæ.

Analytical Key to the Genera of Cirolanidæ *.

- a. Peduncle of second antennæ five-jointed. Plate of second joint of maxillipeds furnished with hooks. First and second pleopods alike, with at least inner branch submembranaceous. Uropoda with inner angle of peduncle produced 3. *Cirolana*.
- a'. Peduncle of second antennæ four-jointed. Plate of second joint of maxillipeds without hooks. Pleopoda with both branches submembranaceous. Uropoda with inner angle of peduncle very little produced. Superior antennæ with first joint of peduncle quite short, and extended straight in front at a right angle to remaining part of the antenna 4. *Eurydice*.

3. CIROLANA, Leach.

Analytical Key to the Species of Cirolana.

- a. Head without median process. First pair of antennæ reach apex of peduncle of second pair of antennæ. Terminal abdominal segment subtriangular, armed on its posterior margin with twenty-six spines. Both branches of the uropoda rounded posteriorly and armed with spines 4. *C. Harfordi* (Lockington).
- a'. Head with long, straight, median projection. First pair of antennæ reach the posterior margin of the third thoracic segment. Terminal abdominal segment rounded and creulate on its posterior margin, and fringed with long hairs. Inner branch of the uropoda obliquely truncate posteriorly .. 5. *C. linguifrons*, sp. n.

* The characters in this key on the Cirolanidæ are taken from Stebbing, 'History of Crustacea' (1893), p. 342.

4. *Cirolana Harfordi* (Lockington).

Æga Harfordi, Lockington, Proc. Cal. Acad. Sci. vii. 1877, pt. i. p. 46.
Cirolana californica, Hansen, Vidensk. Selsk. Skr. 6th ser., natur. og math. Afd. v. 1890, pp. 338, 339.

Hab. Victoria, British Columbia. California: Santa Rosa Island, San Diego, Catalina Harbour, Pacific Grove, Monterey Bay; Lower California, specimens lighter in colour.

Miers* remarks upon having examined specimens of *Æga Harfordi*, sent by Mr. Lockington to the British Museum and designated *Idotea Harfordi* in a manuscript note of the author. He considers that the specimens belong to the genus *Cirolana* or a closely allied type, without further identifying them. Hansen† also states that, according to Miers, *Æga Harfordi* is probably a *Cirolana*. He had not seen Lockington's description, but followed Miers regarding the systematic position of the species.

Specimens of *Æga Harfordi* were sent by Mr. S. J. Holmes to the National Museum from the California Academy of Sciences, which prove to be identical with *Cirolana californica*, Hansen.

5. *Cirolana linguifrons*, sp. n.

Colour yellow, marked with scattered black dots. Body elongate-ovate, about five times longer than broad, greatly convex.

Fig. 2.



Cirolana linguifrons. $\times 13\frac{1}{2}$. a, head; b, terminal segment.

Head with the frontal margin produced in a long straight process, rounded anteriorly, and somewhat dilated. Eyes large, distinct. First pair of antennæ with joints of the peduncle large; flagellum of fifteen short joints extends to the posterior margin of the third thoracic segment. Second

* Miers, Journ. Linn. Soc. London, xvi. 1883, p. 19.

† Hansen, Vidensk. Selsk. Skr. 6th ser., natur. og math. Afd. v. 1890, pp. 338, 339; for synonymy see p. 357.

pair of antennæ, with a flagellum of thirteen long joints, extend to the posterior margin of the fifth thoracic segment.

The first three segments of the thorax are short; the other four segments are long. The epimera of the second, third, and fourth segments are not produced at the apex; those of the fifth, sixth, and seventh but slightly produced.

All the abdominal segments conspicuous, the first five being of equal length. The terminal segment is rounded posteriorly, faintly crenulate, and fringed with long hairs. The base of this segment is raised above the other portion and has a well-defined edge with two points extending backward, one on either side of the median line. The uropoda extend beyond the tip of the abdomen; the inner branch is obliquely truncate; the outer branch is more rounded; both branches are fringed with long hairs.

The prehensile legs are short; the gressorial legs are long and slender. The legs increase gradually in length from the first to the seventh pair.

Two specimens, from Monterey Bay, California, collected by Mr. Heath from sandy shore at mean tide.

Type. No. 22564, U.S. N. M.

4. EURYDICE, Leach.

6. *Eurydice caudata*, sp. n.

Body elongate and narrow. In male abdomen is equal in length to thorax; in female it is shorter. Surface of body smooth.

Head widely rounded in front; its anterior margin narrowly thickened. Eyes large and round, and situated at a distance of one third the width of the head apart. First pair of antennæ extend to the posterior margin of the head; flagellum contains five articles, the first of which is very long and those following quite short. The second pair of antennæ extend as far as the posterior margin of the fourth segment of the abdomen; the flagellum consists of twenty-five long slender joints. In the female the second pair of antennæ are much shorter, reaching only to the posterior margin of the last thoracic segment; the flagellum contains about twenty joints.

The thoracic segments are subequal. The epimera are narrow, and those of the last three or four segments acutely pointed.

All the abdominal segments are visible in a dorsal view. The terminal segment is rounded at the sides and truncate at

its extremity, the lateral angles being produced in a short triangular process, between which the posterior margin is distinctly denticulate and bears four spines, which are about twice as long as the lateral teeth. The uropoda are short, not reaching the extremity of the terminal segment, are truncate and crenulate on their posterior margins. The uropoda, as well as the terminal segment, are fringed with short hairs.

The legs are long and slender and armed with many spines.

Colour light brown marked with black spots.

Individuals of this species were collected at Isthmus Cove, Catalina Island, California, by the U.S. Fish Commission steamer 'Albatross.'

Type. No. 22565, U.S. N. M.

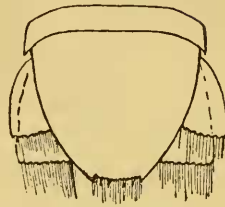
This species resembles *E. Grimaldii*, Dollfus *, more closely than it does any other species of the genus. It differs in the following characters:—

1. The greater number of joints in the flagellum of the first pair of antennæ. In our species there are five joints, while in *E. Grimaldii* the flagellum is uniaarticulate.

2. In the fewer number of joints in the flagellum of the second pair of antennæ. In our species there are only twenty-five, while in *E. Grimaldii* the flagellum contains thirty-two articles.

3. In the presence of four spines on the posterior margin of the terminal segment. In *E. Grimaldii* the posterior margin is denticulate; in our species it is denticulate and also bears four spines.

Fig. 3.



Eurydice caudata. Last two abdominal segments, greatly enlarged.

Family IV. Corallanidæ.

5. CORALLANA, Dana.

7. *Corallana truncata*, sp. n.

Body elongate, about three and a half times longer than wide; colour yellow.

* Bull. Soc. Zool. France, xiii. 1888, pp. 35, 36; "Sur quelques Crustacés Isopodes du Littoral des Açores," A. Dollfus.

Head with a small median point. Eyes large, situated but a little distance apart. First pair of antennæ, with a flagellum of about nine articles, extend to the antero-lateral angle of the first thoracic segment. Second pair of antennæ broken in specimen.

Fig. 4.

*Corallana truncata.* $\times 13\frac{1}{2}$.

a, head; *b*, abdomen and last thoracic segment.

First segment of the thorax is as long as the head, and about one and a half times longer than any of the other segments. Epimera of the second and third segments narrow; those of the remaining segments very broad.

The first abdominal segment is almost entirely covered by the last thoracic segment. The second, third, and fourth segments are tuberculated on their posterior margins. The fifth segment is also tuberculated, the tubercles on either side of the median line of tubercles being larger and more conspicuous. At the base of the terminal segment are four tubercles, the two centre ones being the larger. The terminal segment is subtriangular with truncate apex. The posterior margin is armed with spines. The inner branch of the uropoda is truncate posteriorly and armed with spines; it is about twice as broad as the outer branch, which is lanceolate in shape.

There is but one specimen, from Catalina Island, California; collected by Dr. J. G. Cooper.

Type. No. 22566, U.S. N. M.

Family V. *Ægidæ*.

Analytical Key to the Genera of Ægidæ.

- a.* Body rather compact. Superior antennæ short, with first two peduncular joints more or less expanded. Epistome large, linguiform, projecting between the bases of inferior antennæ. Maxillipeds with palp composed of five joints. Anterior pairs of legs with propodus simple, cylindrical, not expanded, dactylus abruptly curved in middle. Front separating the whole or a great part of the first article of the first pair of antennæ. Flagellum of first pair of antennæ composed of many articles. Abdomen compact . . . 6. *Æga*.

- a'. Body more depressed than in *Æga*. Superior antennæ short, with basal joints not expanded. Epistome very small and narrow. Maxillipeds with palp composed of only two joints. Anterior pair of legs with propodus more or less expanded, dactylus forming a very large and evenly curved hook. Front covering more or less the peduncle of the first pair of antennæ. Flagellum of first pair of antennæ composed of four to six articles. Abdomen relaxed 7. *Rocinela*.

6. *ÆGA*, Leach.*Analytical Key to Species of Æga.*

- a. Eyes very small; second joint of first pair of antennæ without process at its apex; terminal abdominal segment triangular, with rounded apex; inner branch of uropoda with apex faintly arcuate obliquely . 8. *Æ. microphthalmia*, [Dana.]
- a'. Eyes almost contiguous; second joint of first pair of antennæ with a process at its apex nearly as long as following joint; terminal abdominal segment with its apex arcuate-truncate; inner branch of uropoda subtruncate 9. *Æ. Lecontii* (Dana).

8. *Æga microphthalmia*, Dana.

Æga microphthalmia, Dana, Proc. Acad. Nat. Sci. Philad. vii. 1854, p. 176; Stimpson, Journ. Bost. Soc. Nat. Hist. vi. 1857, p. 68.

Hab. Monterey, California.

9. *Æga Lecontii* (Dana).

Ægacylla Lecontii, Dana, Proc. Acad. Nat. Sci. Philad. vii. 1854, p. 177; Stimpson, Journ. Bost. Soc. Nat. Hist. vi. 1857, p. 69.

Hab. California.

Body elongate, oval; surface smooth; colour yellow, with a few brown dots; eyes reddish brown.

Head with anterior margin bisinuated, the median point separating the basal joints of the first pair of antennæ and extending one third the length of these joints. Eyes large, oval, very close together at upper inner angle. First pair of antennæ with basal joints very large, dilated; second joint of peduncle dilated, and with a process at its apex extending nearly the length of the third joint; third joint very narrow, about one third the width of two preceding joints; flagellum, composed of seven joints, extends the length of the peduncle of second pair of antennæ. Second pair of antennæ, with a

flagellum of twelve joints, extend almost to the posterior margin of the first thoracic segment.

The last four thoracic segments are each a little longer than any of the first three. The epimera are narrow, with rounded post-lateral angles.

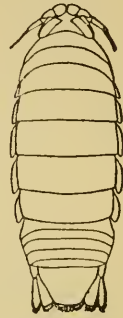
The five abdominal segments are of equal length. The terminal segment is subtriangular, with truncate extremity; its posterior margin is crenulate and fringed with hairs. The uropoda exceed slightly the length of the abdomen. The inner branch is about twice as wide as the outer branch; is obliquely truncate and crenulate. The outer branch is narrow, rounded posteriorly, and smooth. Both branches are fringed with hairs.

The legs are long and slender. Five spines are present on the merus of the prehensile legs. The gressorial legs are but slightly spinulose.

Two specimens examined were collected at Monterey Bay, California, by Mr. Heath.

The description of this species of *Æga* by Dana as *Ægacylla Lecontii* was from a young specimen*. The individual sent us is thought to be the adult form, and differs from Dana's description † of the young individual in the crenulated posterior margin of the terminal segments, in the truncated inner branch of the uropoda, and in the addition of two joints to the length of the flagellum of the second pair of antennæ.

Fig. 5.

*Æga Lecontii* (Dana). × 2.

7. ROCINELA, Leach.

Analytical Key to the Species of Rocinela.

- a. Flagellum of second pair of antennæ with fourteen to sixteen joints.
- b. Propodus of prehensile legs with two to four spines.

* Schiödte and Meinert regard *Ægacylla*, Dana, as synonymous with *Æga*, and remark that Dana's specimen, by which the genus *Ægacylla* was instituted, was a young *Æga*. See 'Naturhistorisk Tidsskrift,' xii. 1879-80, p. 334. See also Lütken, Vid. Medd. Naturh. For. 1860, p. 180.

† There are no specimens of the young in the National Museum.

- c. First thoracic segment with antero-lateral angles produced horn-like at sides of head. Frontal margin of head produced. Spots wanting on fourth and fifth abdominal segments and base of terminal segment 10. *R. cornuta*, Richardson.
- c'. First thoracic segment normal. Frontal margin of head not produced. Spots present on fourth and fifth abdominal segments and base of terminal segment 11. *R. belliceps* (Stimpson).
- b'. Propodus of prehensile legs with five or six spines 12. *R. laticauda*, Hansen.
- a'. Flagellum of second pair of antennæ with ten to eleven joints.
- b. Tubercles developed on all the segments of the body 13. *R. tuberculosa*, Richardson.
- b'. No tubercles developed on body. Terminal segment of body ornamented with a very wide crescentiform band, from whose posterior border three large hastiform stripes project backwards 14. *R. aries*, Schiödte & Meier. [nert.]

10. *Rocinela cornuta*, Richardson.

Rocinela cornuta, Richardson, Proc. Am. Phil. Soc. xxxvii. 1898, p. 12, figs. 1, 2.

Hab. Off Shumagin Bank, Alaska.

11. *Rocinela belliceps* (Stimpson).

Æga belliceps, Stimpson, Proc. Acad. Nat. Sci. Philad. xvi. 1864, p. 155.

Æga alaskensis, Lockington, Proc. Cal. Acad. Sci. vii. 1877, pt. i. p. 46.

Rocinela alascensis, Richardson, Proc. Am. Phil. Soc. xxxvii. 1898, p. 11.

Hab. Cortes Bank, California, to Alaska and Bering Sea.

12. *Rocinela laticauda*, Hansen.

Rocinela laticauda, Hansen, Bull. Mus. Comp. Zool. xxxi. 1897, no. 5, pp. 108, 109; Richardson, Proc. Am. Phil. Soc. xxxvii. 1898, pp. 14, 15, figs. 5, 6.

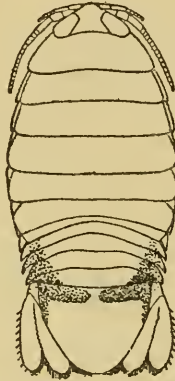
Hab. Off Acapulco; near Tres Marias Islands; off Mazatlan; off San Luis Obispo Bay, California; off Esteros Bay, California; Puget Sound, Washington; Unimak Island, Alaska.

13. *Rocinela tuberculosa*, Richardson.

Rocinela tuberculosa, Richardson, Proc. Am. Phil. Soc. xxxvii. 1898, p. 16, fig. 10.

Hab. Southern part of Gulf of California.

Fig. 6.



Rocinela belliceps (Stimpson). $\times 2\frac{2}{3}$.

14. *Rocinela aries*, Schiödte & Meinert.

Rocinela aries, Schiödte & Meinert, Naturhistorisk Tidsskrift, xii. 1879-80, pp. 401-403, pl. xiii. figs. 7, 8.

Hab. Mazatlan; Lower California; Panama Bay.

Family VI. *Cymothoidæ*.

Analytical Key to the Genera of Cymothoidæ.

- a. Head deeply immersed or set in the first thoracic segment, whose antero-lateral angles project forward.
- b. Abdomen deeply immersed.
 - First pair of antennæ more often dilated, rarely compressed. First four or five segments of body long, subequal in length, except the first, which is a little longer; last two or three segments abruptly shorter, very often decreasing gradually in length. Terminal segment of abdomen subtriangular or semicircular, often bilobed. Body oblong 8. *Meinertia*.
 - b'. Abdomen scarcely immersed.
 - First pair of antennæ very much compressed. Segments of thorax either equal in length or the first segment abruptly longer than the others and the last segment abruptly shorter than the others. Terminal segment of the abdomen varying in size and form. Body suboval, more or less contorted. 9. *Livoneca*.

a'. Head not at all immersed.

b. Body relaxed. Posterior angles of first segment of body prominent or produced, very often acute; posterior angles of the following segments increasing gradually in length, the first of these very often scarcely prominent, the posterior ones very often produced, abruptly longer than the first. Epimera of the first segments very often involuted, and extending beyond the posterior angle of the segment; posterior ones produced, acute. Sides of the first five segments of abdomen more or less profoundly incised 10. *Nerocila*.

b'. Body compact. Posterior angles of first segment of body scarcely prominent, occasionally produced, those of following five segments scarcely or not at all prominent; those of seventh segment produced. Epimera of first segments very often almost reaching, or not reaching by a short distance, the posterior angle of the segment. Sides of the first segments of the abdomen whole or obscurely emarginated, of the posterior ones gradually more profoundly emarginated or incised 11. *Anilocra*.

8. MEINERTIA, Stebbing*.

15. *Meinertia Gaudichaudii* (Milne-Edwards).

Cymothoa Gaudichaudii, Milne-Edwards, Hist. Nat. Crust. iii. 1840, p. 271.

Ceratothoa rapax, Heller, Reise Novara, Crust. xii. p. 146, fig. 17.

Ceratothoa Gaudichaudii, Schiödte & Meinert, Naturhistorisk Tidsskrift, xiii. 1881-83, pp. 335-340, pl. xiii. figs. 11-15.

Hab. Mazatlan.

9. LIVONECA, Leach.

Analytical Key to the Species of Livoneca.

- a*. Terminal segment obscurely carinated, and sides infolded. Caudal appendages destitute of accessory lamellæ. [& Meinert. 16. *L. californica*, Schiödte
- a'*. Terminal segment not carinated, sides not infolded. Caudal appendages furnished with accessory lamellæ.
- b*. Inner branch of uropoda a little longer and wider than outer branch. Terminal segment sublinguate. Abdomen deeply set in thorax 17. *L. vulgaris*, Stimpson.
- b'*. Inner branch of uropoda a little longer and much narrower than outer branch. Terminal segment semicircular. Abdomen less deeply inserted in thorax [& Meinert. 18. *L. panamensis*, Schiödte

* Hist. of Crust. 1893, p. 345.

16. *Livoneca californica*, Schiödte & Meinert.

Livoneca californica, Schiödte & Meinert, Naturhistorisk Tidsskrift, xiv. 1883-84, pp. 372-374, pl. xvi. figs. 1, 2.

Hab. Shores of California, near San Francisco.

17. *Livoneca vulgaris*, Stimpson.

Livoneca vulgaris, Stimpson, Journ. Bost. Soc. Nat. Hist. xxii. 1857, p. 68, pl. xxii. fig. 9; Schiödte & Meinert, Naturhistorisk Tidsskrift, xiv. 1883-84, pp. 344-349, pl. xiv. figs. 1, 2.

Hab. Shores of California, near San Francisco, to Santa Margarita Island, Lower California.

18. *Livoneca panamensis*, Schiödte & Meinert.

Livoneca panamensis, Schiödte & Meinert, Naturhistorisk Tidsskrift, xiv. 1883-84, pp. 349-353, pl. xiii. figs. 11, 12.

Hab. Mazatlan; west shores of Central America; Panama.

10. NEROCILA, Leach.

19. *Nerocila californica*, Schiödte & Meinert.

Nerocila californica, Schiödte & Meinert, Naturhistorisk Tidsskrift, xiii. 1881-83, pp. 72-76, pl. v. figs. 12, 13, pl. vi. figs. 1, 2.

Hab. San Diego, California; Panama Bay.

11. ANILOCRA, Leach.

20. *Anilocra occidentalis*, sp. n.

Body two and a half times longer than broad.

Head large, broader than long, one half as broad as the first thoracic segment, produced in front in a short, blunt process, whose anterior edge is roundly truncate. Eyes large, situated at a distance equal to almost half the width of the head apart. The first pair of antennæ are composed of eight joints and extend to the middle of the first thoracic segment. The second pair of antennæ are composed of nine joints and extend to the posterior angle of the first thoracic segment; they are more slender than the first pair of antennæ.

The first thoracic segment is trisinuated on its anterior margin, and is one and a half times longer than the second thoracic segment. The other segments are subequal. The sixth and seventh segments are somewhat narrower than the fifth, and the seventh is a little narrower than the sixth.

All the epimera are long and narrow and more or less rounded posteriorly; they extend fully to the posterior angle of their corresponding segments, a character not found in any other species of the genus.

The first abdominal segment is partly covered at the sides by the last thoracic segment. The first five segments are about equal in length and width. The terminal segment is slightly wider than long, equal in length to the other abdominal segments taken together, is impressed at the base, and posteriorly rounded. The uropoda are longer than the last abdominal segment. Both branches are similar in shape and size; they are oar-like, with truncately rounded extremities.

The legs increase slightly in length. The basis of all the legs is carinated on the inferior margin.

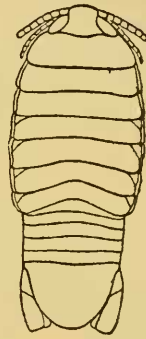
Colour a light brown, marked with numerous black dots over the whole surface of the body, with the exception of the posterior half of the last abdominal segment and the inner branch of the uropoda, which are a light clear yellow without spots. The outer branch of the uropoda, which is almost black, contrasts in a marked degree with the light inner branch. In the caudal segment the change from the darker to the lighter half is graduated, making the contrast less marked.

Two individuals of this species were taken: one by the U.S. Fish Commission steamer 'Albatross,' station 3138, at a depth of 19 fathoms, and one by Dr. D. S. Jordan, both at Monterey Bay, California. One was imperfect.

Type. No. 22567, U.S. N. M. Monterey Bay. Depth 19 fathoms.

When compared with *A. laevis*, Miers*, from Peru, this species differs in the shape of the anterior portion of the head, which in *A. laevis* is narrowed and rounded, while in *A. occidentalis* it is truncate; in the greater length of the first thoracic segment and the equality in length of the succeeding segments in *A. occidentalis*, while in *A. laevis* the sixth segment is the longest, the others being of nearly equal length; in the length of the epimera, which in *A. occidentalis* attain

Fig. 7.

*Anilocra occidentalis.* × 4.

* Proc. Zool. Soc. London, 1877, p. 672, pl. lxxviii. fig. 6.

the posterior margin of the corresponding segments, while with *A. lævis* they are all very small and somewhat spini-form in the fifth to the seventh segments; in the greater breadth posteriorly of the terminal segment of the body in *A. lævis*, and in the shape and length of the uropoda in the two species, the two branches being of unequal length, lamellate in shape (the inner one the longer), and both shorter than the last segment of the body in *A. lævis*, while in *A. californica* they are equal in length, similar in shape, oar-like, and longer than the terminal segment.

Family VII. Sphæromidæ.

Analytical Key to the Genera of Sphæromidæ.

- a. Both exterior and interior branches of uropoda projecting.
 - b. Terminal segment of the abdomen excavated at its extremity 12. *Dynamene*.
 - b'. Terminal segment of abdomen entire.
 - c. Margins of head not produced; antennæ conspicuous; legs normal; mandibles with five-jointed palp 13. *Sphæroma*.
 - c'. Anterior and lateral margins of head produced, concealing antennæ; propodus of first and second pairs of legs dilated, with reflexed dactylus; mandibles with three-jointed palp. 14. *Tecticeps*.
- a'. Only exterior branch of uropoda projecting; penultimate abdominal segment in male generally produced in spine; terminal segment excavated with median tooth 15. *Cilicæa*.

12. DYNAMENE, Leach.

Analytical Key to the Species of Dynamene.

- a. Frontal margin of head produced in a quadrangular process; first two joints of first pair of antennæ dilated. 21. *D. dilatata*, sp. n.
- a'. Frontal margin of head not produced; joints of first pair of antennæ not dilated.
 - b. Abdomen tuberculated. Neither branch of uropoda reaching extremity of abdomen 22. *D. tuberculosa*, sp. n.
 - b'. Abdomen not tuberculated. Inner branch of uropoda reaching extremity of abdomen.
 - c. Ultimate segment of abdomen ridged. Branches of uropoda of equal length. Sinus at extremity of abdomen funnel-shaped 23. *D. benedicti*, sp. n.

- c'. Ultimate segment of abdomen smooth.
Outer branch of uropoda but little
more than half as long as inner
branch. Sinus at extremity of ab-
domen small *D. glabra*, sp. n.

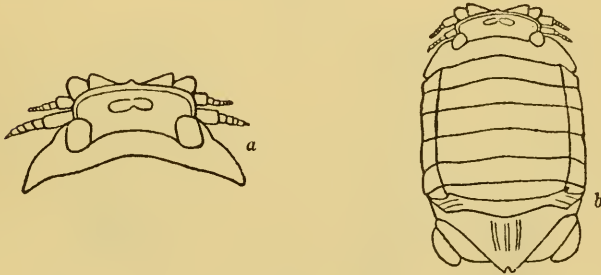
It has been suggested by several authors * that *Dynamene* may prove to be the female of *Næsa*, but until facts can be produced to substantiate this assumption, it is necessary to retain the genus *Dynamene*.

21. *Dynamene dilatata*, sp. n.

Body oval; surface very granular; colour yellow.

Head rugose, with its anterior margin produced in a quadrangular process, having a small median projection, rounded antero-lateral angles, and a thickened edge. First

Fig. 8.



Dynamene dilatata.

a, head and first thoracic segment, $\times 13\frac{1}{3}$; b, dorsal view, $\times 10\frac{2}{3}$.

pair of antennæ extend to the posterior margin of the head, first two joints flattened and enlarged; first joint oblong; second joint triangular, and half as long as preceding joint; third joint small, as long as second, but half as wide; flagellum six-jointed. Second pair of antennæ are but little longer than first pair and do not reach the posterior margin of the first thoracic segment.

The thoracic segments are of equal length. The epimera are square or oblong, with straight lateral margins.

The penultimate abdominal segment is short and crossed with suture-lines. The terminal segment is triangular, with a small rounded notch at the apex. There are three longi-

* Hesse, Ann. Sci. Nat. 5th ser. xvii. pp. 5, 6; Stebbing, Hist. of Crust. 1893, p. 361; Bate & Westwood, British Sessile-eyed Crust. ii. p. 432.

tudinal ridges on the segment, one in the median line and one on either side of it. The uropoda are short, not reaching the extremity of the abdomen, and regularly rounded.

The legs are slender; the first two pairs are covered with long hairs and extend in an anterior direction, the other five pairs extend in a posterior direction.

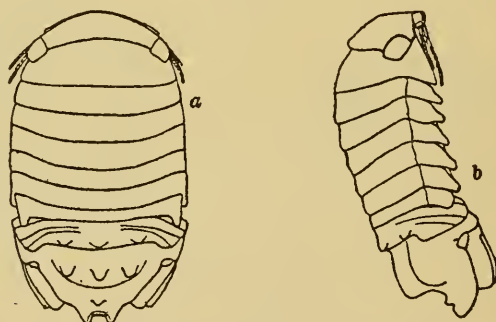
The type and only specimen was collected by Mr. Heath at Monterey Bay, California, at the surface. No. 22568, U.S. N. M.

22. *Dynamene tuberculosa*, sp. n.

Body oblong-ovate; colour light yellow, almost white; surface of abdomen tuberculated.

Head large, much broader than long, with a wide anterior margin, broadly curving on either side of a small median

Fig. 9.



Dynamene tuberculosa. $\times 8$. a, dorsal view; b, lateral view.

point. Eyes small, and situated at the extreme post-lateral angle of the head. The first pair of antennæ, composed of eight articles, reach beyond the middle of the first thoracic segment. The second pair of antennæ, composed of twelve articles, extend to the posterior angle of the first thoracic segment.

The first segment of the thorax is one and a half times longer than any of the other segments, which are about equal in length. The epimera, which are distinctly marked, and roundly produced at their posterior angles, are much broader than long.

The first abdominal segment is transversely crossed by three suture-lines, indicated at the sides of the segment. Three small tubercles are situated in a transverse line on the posterior

margin of this segment. The terminal segment is subtriangular in shape, with a broad funnel-like excavation at its extremity, formed by the infolding of the lateral edges. The anterior part of the terminal segment is very convex, upon which elevation are situated three large tubercles in a transverse row, the centre one being in the median line. At the base of the terminal excavation is also a small tubercle. Both branches of the uropoda are similarly shaped, being of the same width throughout their entire length and rounded posteriorly. The outer branch is somewhat shorter than the inner branch; neither reaches the extremity of the abdomen.

Individuals were found at Gualala, California, on *Haliotis rufescens*, by Dr. R. E. C. Stearns; also one specimen at Catalina Harbour, California, and one at Popoff Island, Aleutian Islands, at low water, by Mr. W. H. Dall.

Type. No. 22569, U.S. N. M. Popoff Island, Aleutian Islands.

23. *Dynamene benedicti*, sp. n.

Body oblong, oval; surface minutely granular; colour dark grey.

Head with small median point. Eyes situated post-laterally. First pair of antennæ extend to the middle of the first thoracic segment; first joint of peducule longest; second and third joints about equal in length; flagellum contains six joints. Second pair of antennæ extend to the posterior margin of the second thoracic segment; flagellum contains about eleven joints.

The thoracic segments are of equal length. The epimera are square, with rounded posterior angles.

The penultimate abdominal segment is crossed by suture-lines indicative of coalesced segments.

The terminal segment is triangular, terminating posteriorly in two teeth separated by a narrow, rounded, funnel-shaped sinus. This segment is very convex, and bears two longitudinal ridges on either side of the median line. The uropoda do not exceed in length the extremity of the terminal segment. Both branches are rounded posteriorly and are similar in shape and size.

The type was collected by Mr. Heath at Monterey Bay, California, at the surface. No. 22570, U.S. N. M.

Fig. 10.



Dynamene benedicti. $\times 13\frac{1}{2}$.
Last thoracic segment and abdomen.

24. *Dynamene glabra*, sp. n.

Body oval; surface smooth.

Head small; eyes situated post-laterally. First pair of antennæ extend to the eye; first joint oblong; second joint short, half as long as first; flagellum contains six articles. Second pair of antennæ extend to the posterior margin of the first thoracic segment; flagellum contains about ten articles.

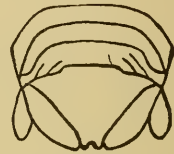
Thoracic segments are subequal; the first is a little longer than any of the others.

The penultimate abdominal segment consists of several coalesced segments, as indicated by the suture-lines. The terminal segment is triangular, with a small median excavation at its extremity. The lower part of this segment is quite flat, the slope being gradual from the convex upper part or base of segment to the extremity. The inner branch of the uropoda is large and rounded posteriorly; the outer branch is small, though similar in shape, and is much shorter than the inner branch.

A number of specimens were collected by Mr. Heath at Monterey Bay, California, at the surface.

Type. No. 22571, U.S. N. M.

Fig. 11.



Dynamene glabra. $\times 13\frac{1}{2}$.
Abdomen and last two thoracic segments.

13. SPHÆROMA, Latreille.

Analytical Key to the Species of Sphæroma.

- a. Body widening gradually from head backwards. Thorax transversely ridged and provided with three longitudinal rows of small tubercles. Branches of the uropoda very large, expanded 25. *S. amplicauda*, Stimpson.
- a'. Body not increasing in width. Surface of thorax smooth. Branches of the uropoda not expanded.
 - b. Extremity of abdomen produced in a rhomboid process 26. *S. rhomburum*, sp. n.
 - b'. Extremity of abdomen not produced.
 - c. Surface of abdomen tubercular 27. *S. octoncum*, sp. n.
 - c'. Surface of abdomen smooth 28. *S. oregonensis*, Dana.

25. *Sphæroma amplicauda*, Stimpson.

Sphæroma amplicauda, Stimpson, Proc. Bost. Soc. Nat. Hist. vi. 1857, p. 89.

Hab. Tomales Bay, California.

Stebbing* suggests that a new genus near *Cycloidura* may be required for this species.

26. *Sphæroma rhomburum*, sp. n.

Surface of body punctate; colour whitish yellow.

Head small. First pair of antennæ reach almost to the posterior margin of the first thoracic segment. Second pair of antennæ extend quite to the posterior margin of the first thoracic segment. Eyes situated post-laterally.

Thoracic segments equal in length. Epimera broad and short, extending downwards, forming an angle with the segments.

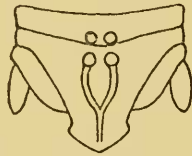


Fig. 12.

Sphæroma rhomburum. $\times 13\frac{1}{3}$.
Abdomen.

First abdominal segment as long as any of the thoracic segments, crossed by suture-lines and surmounted by two tubercles, close together, one on either side of the median line. Terminal segment with its extremity produced in a process rhomboid in shape and with sides infolded, forming a kind of funnel-like opening when seen from beneath. At the base of this segment are two tubercles, which are continuous with two longitudinal ridges in the centre of the segment. These ridges unite near the extremity and continue as one median ridge. The uropoda are shorter than the terminal segment; the outer branch is more lanceolate in shape; both are of equal length.

Two specimens were taken at Monterey Bay, California, by Mr. Heath.

Type. No. 22573, U.S. N. M.

This species is near *S. egregium*, Chilton †, from Arakoa, but differs in the presence of two tubercles on the first abdominal segment, in the presence of two tubercles and two longitudinal ridges uniting in a single ridge on the terminal segment, and in the equality in length of the two branches of the uropoda.

* Hist. Crust. 1893, p. 364.

† Trans. New Zealand Inst. xxiv. 1891, p. 269.

27. *Sphæroma octoncum*, sp. n.

Body with all the thoracic segments, except the first, marked with four conspicuous brown spots, two on either side of the median line, and with two spots on the first abdominal segment, one on either side of the median line.

Head small. First pair of antennæ reach almost to the posterior margin of the first thoracic segment. Second pair extend fully to the posterior margin of the first segment.

Thoracic segments subequal. Epimera broad and extending downward, forming an angle with the segments.

First abdominal segment with two low tubercles close together, situated one on either side of the median line; terminal segment triangular, with apex narrowly rounded and sides slightly infolded, forming a small opening when seen from below. Six low tubercles are situated on this segment, two in longitudinal series on either side of the median line—the lower ones being a little farther apart than the upper ones—and one on either side of the series. The uropoda do not reach the extremity of the abdomen by some little distance. The outer branch is the shorter and is broadly rounded posteriorly. The inner branch is more pointed at the extremity.

Five individuals of this species were sent by Mr. Heath from Monterey Bay, California.

Type. No. 22574, U.S. N. M.

Fig. 13.



Sphæroma octoncum. $\times 13\frac{1}{3}$.
Abdomen.

28. *Sphæroma oregonensis*, Dana.

Sphæroma oregonensis, Dana, Proc. Acad. Nat. Sci. Philad. vii. p. 177;

U.S. Expl. Exp., Crust. ii. p. 778, pl. lii. fig. 4; Stimpson, Journ.

Bost. Soc. Nat. Hist. vi. 1857, p. 69.

Sphæroma olivacea, Lockington, Proc. Cal. Acad. Sci. vii. 1877, pt. i. p. 45.

Hab. Pacific Grove to Alaska.

14. TECTICEPS, Richardson.

Analytical Key to the Species of Tecticeps.

- a. Terminal segment of abdomen pointed.
Outer branch of uropoda much longer than inner branch. First pair of antennæ reach the posterior angle of the first thoracic segment. Second

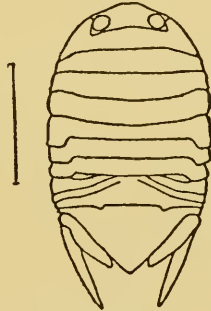
pair reach the middle of the second thoracic segment. Sixth and seventh pair of legs show a marked disproportion in the length of the propodus. Terminal segment of abdomen widely rounded. Outer branch of the uropoda not longer than inner branch. First pair of antennæ reach the posterior angle of the third thoracic segment. Second pair of antennæ reach the middle of the fourth thoracic segment. Sixth and seventh pairs of legs show only a gradual increase in size

29. *T. alascensis*, Richardson.
 30. *T. convexus*, sp. n.

29. *Tecticeps alascensis*, Richardson.

Tecticeps alascensis, Richardson, Proc. Biol. Soc. Washington, xi. 1897, pp. 181-183.

Fig. 14.



Tecticeps alascensis, Richardson. $\times 2\frac{1}{2}$.

Hab. Alaska ; Kamchatka.

30. *Tecticeps convexus*, sp. n.

Body oval, somewhat flattened. Surface smooth ; colour light yellow with markings of brown.

Head with the anterior margin much broader than the posterior margin, produced in front, but not wholly concealing the basal joints of the first pair of antennæ, and somewhat raised, forming two small convex elevations. The anterolateral margin is likewise produced, forming an acute angular projection, which extends in a lateral direction beyond the post-lateral margin of the head. The eyes are dorsally situated in a median transverse line. The first pair of antennæ, with a flagellum of sixteen articles, extend to the posterior angle of the third thoracic segment. The second

pair of antennæ, with a flagellum of thirteen articles, extend to the middle of the fourth thoracic segment, and exceed by

Fig. 15.

*Tecticeps convervus.*

a, head, $\times 5\frac{1}{3}$; *b*, abdomen and last thoracic segment, $\times 2\frac{2}{3}$.

one joint the length of the first pair of antennæ. Both pairs of antennæ are disposed to lie concealed under the broad epimeral plates of the thoracic segments.

The thoracic segments are subequal in length. The first segment has its antero-lateral angles produced around the anterior portion of the head, forming a broad plate at the side of the segment. The epimera are almost twice as broad as long; those of the fifth segment extend downward, with the anterior margin straight, making the length and breadth about equal, and forming almost square epimera; in the epimera of the sixth and seventh segments the anterior margins are in the same direction as the posterior margins, which extend downward.

The first segment of the abdomen has three suture-lines, and its posterior margin is produced in two small points, one on either side of the median line, about equidistant from it and the lateral margin of the segment. The terminal segment is widely rounded posteriorly. The inner branch of the uropoda is of nearly equal width throughout its length and is rounded at its extremity; the outer branch is slender and sharply pointed. Both branches are of nearly equal length and neither extends beyond the tip of the abdomen.

The first pair of legs have the propodus dilated and the dactylus reflexible. The propodus is large and oval in shape. In the legs of the second pair the propodus is irregular in shape, sometimes dilated with reflexible dactylus, and sometimes simple. The legs of the other five pairs are similar in structure, ambulatory, and show a gradual increase in length.

A number of individuals were found at Monterey Bay, California, and sent to the U.S. National Museum by Mr. Heath, who gives the following notes of their habits:—

“They were taken by the Chinese fishermen from a sandy sea-bottom about 30 feet below the surface (according to the Chinese statement). These are rapid swimmers, and the

moment they are disturbed they roll into a ball and project the exopodite of the last free segment. This is undoubtedly for protection. I have not had time to accurately examine the position nor character of this appendage, but its sharp sword-like nature is readily recognized."

Type. No. 22572, U.S. N. M.

This species differs from *T. alascensis* in having longer antennæ and antennulæ; in having a rounded terminal segment, which in that species is very pointed; in having the outer branch of the uropods as short as the inner, which in that species is much longer; in having only a gradual increase in the length of the legs, which in that species show such marked disproportions in the propodus of the sixth and seventh pairs; and in the position of the eyes, which in this species are situated in the median transverse line of the head, while in *T. alascensis* they are placed in the posterior half of the head.

15. CILICÆA, Leach.

Analytical Key to the Species of Cilicæa.

a. Surface of body smooth.

b. Terminal segment with three sinuses, one above another, the two upper openings heart-shaped. Terminal segment as broad as long. Outer branch of the uropoda armed with four spines, broad and flat at upper end, and tapering to extremity, which does not reach beyond the tip of the abdomen

31. *C. cordata*, sp. n.

b'. Terminal segment with a large sinus, in which are placed six sharp teeth. Terminal segment nearly twice as broad as long. Outer branch of the uropoda smooth, slender, cylindrical, and reaching much beyond the tip of the abdomen

[subsp. n.
32. *C. cordata gilliana*,

a'. Surface of body densely granulated. Terminal segment with a quadrangular excavation, in the centre of which is a long tooth

33. *C. granulosa*, sp. n.

The position of the three following species is somewhat doubtful, since they lack the spine on the penultimate abdominal segment, which is characteristic of the genus *Cilicæa*. It has been noted by Stebbing *, by Miers †, and by Haswell ‡ that with many species of *Cilicæa*, as well as with some of the other genera of the Sphæromidæ, the spine is present and developed in the males but wanting in the females. As our

* Hist. Crust. 1893, p. 364.

† Zool. Coll. 'Alert,' 1884, p. 308.

‡ Proc. Linn. Soc. New South Wales, vi. p. 183.

three new species agree with the generic characters of *Cilicæa* except in the presence of the spine, we consider them for the present new and undescribed species of *Cilicæa*.

31. *Cilicæa cordata*, sp. n.

Body attenuated in front; colour a faint yellow, profusely marked with a delicate pink tint.

Head with the anterior margin thickened, and slightly produced in front. Prominent median point triangularly

Fig. 16.



Cilicæa cordata. $\times 8$.
a, head and first thoracic segment; b, dorsal view.

shaped. Frontal margin broadly lobed on either side of median point. Eye situated at post-lateral angle of head. First pair of antennæ reach beyond the posterior margin of head; first joint of peduncle oblong; second joint very short; flagellum contains about nine articles. The second pair of antennæ extend to the posterior angle of the third thoracic segment; the flagellum contains about fifteen articles.

The thoracic segments are about equal in length, with the exception of the first, which is a little longer than any of the others. The epimera are very broad and drawn out to an apex, which is rounded. They are scarcely visible in a dorsal view, as they project downward laterally, forming an angle with the segments. The last thoracic segment is furnished with low tubercles on its posterior margin.

On the first abdominal segment are five double tubercles.

The terminal segment of the body has three sinuses, one above another, the two upper openings being heart-shaped. Six teeth are grouped in a series of two each, and are placed in such regularity as to give the appearance of a triple sinus. At the base of the upper sinus is a large rounded tubercle, peaked at the top. Three double tubercles are also situated at the base of the abdomen. The inner branch of the uropoda is fixed and immovable; it is broad and pointed at its extremity and extends two thirds the length of the terminal segment. The outer branch is long and slender, broad and flattened above, more rounded and tapering at the extremity, somewhat incurved, and extends a little beyond the end of the abdomen. Its outer edge is crenulate and its under surface armed with four spines.

The legs are long and slender, all ambulatory, and with dactylus biunguiculate.

Two specimens were collected at Popoff Island (Aleutian Islands) by Mr. W. H. Dall at low water.

Type. No. 22575, U.S. N. M., Popoff Island.

Another individual was found at Catalina Island, California, by Dr. J. G. Cooper. In this specimen the sixth thoracic segment is also tuberculated. One specimen was found by Mr. Heath at Monterey Bay on the pink coralline at low tide, and is shaded with a delicate pink. In this specimen, on the seventh thoracic segment and the penultimate abdominal segment, the tubercles on either side of the median line of tubercles are single instead of double.

32. *Cilicæa caudata gilliana*, subsp. n.

Body slightly attenuated in front. Colour light brown with markings of black.

Head with anterior margin thickened and slightly produced. Large median point triangularly shaped, on either side of which the frontal margin of the head is broadly lobed. Eye situated at the posterior angle of the head. First pair of antennæ reach beyond the posterior margin of the head; first joint of peduncle is oblong; second joint very small; flagellum contains eight joints. The second pair of antennæ are broken in the specimens examined.

The thoracic segments are about equal in length, with short but very broad epimera, which extend downward laterally, forming an angle with the segments. The last segment is ridged with very low tubercles on its posterior margin.

The first abdominal segment has two suture-lines, indicative of coalesced segments, and bears five double tubercles.

The terminal segment has a large sinus in which are situated six sharp teeth. At the base of the sinus is a large tubercle. Three double tubercles are also found at the base of the terminal segment. The inner branch of the uropoda is affixed to the sides of the abdomen and extends two thirds of its length; it is triangularly pointed at its extremity. The outer branch is long and slender, almost cylindrical in shape, smooth, somewhat incurved, and extends much beyond the tip of the terminal segment.

The legs, all ambulatory, are slender, with dactylus uniunguiculate.

Specimens were dredged off *Cilicea caudata gilliana*. × 8. Catalina Island, California.

Type. No. 22576, U.S. N. M.

These specimens differ from *Cilicea caudata* (Say)* in the presence of six distinct teeth within the sinus of the terminal segment, while in that species there are but four; in the greater development of the spine at the base of the sinus; and in the median double tubercle at the base of the terminal segment.

33. *Cilicea granulosa*, sp. n.

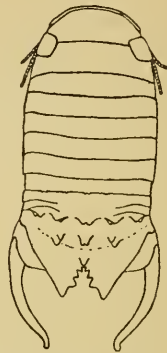
Surface of body densely granulated; granules large and close together.

Head with anterior margin thickened, and produced in a small median point, on either side of which the margin is lobed. Eyes situated post-laterally. First pair of antennæ extend to the posterior margin of the first thoracic segment; first joint of peduncle oblong; second joint short. Second pair of antennæ extend to the posterior margin of the third thoracic segment.

The first thoracic segment is longer than any of the following segments. The cpimera are twice as broad as long.

The first abdominal segment is short and bears indications

Fig. 17.



* *Cilicea caudata* (Say).

Næsa caudata, Say, Journ. Phil. Acad. i. p. 482; Milne-Edwards, Hist. Nat. des Crustacés, iii. p. 219.

Cymodocea caudata, Ives, Proc. Acad. Nat. Sci. Philad. 1891, p. 188, pl. vi. figs. 11-14.

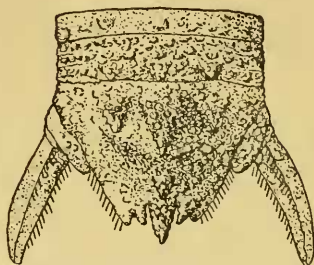
of three coalesced segments. There are three transverse elevations on this segment, which are densely covered with granules. The terminal segment bears three transverse elevations at the base, the median one terminating in a spine. On its posterior margin is a quadrangular excavation, with a long median tooth, bearing a spine at its extremity. At the base of the tooth is a small elevation. On either side of the terminal excavation, a short distance up the lateral margin, is a small spine. The fixed inner branch of the uropoda is small and short; the outer branch is long, blunt at the extremity, somewhat incurved, and reaches, when open, much beyond the terminal segment. The margins of the terminal segment and the edges of the outer branch of the uropoda are pubescent.

The legs are all simple, ambulatory.

One specimen from Cerros Island, Lower California, was collected by Mr. A. W. Anthony, at a depth of 20 fathoms.

Type. No. 22649, U.S. N. M.

Fig. 18.



Cilicæa granulosa. $\times 8$. Last thoracic segment and abdomen.

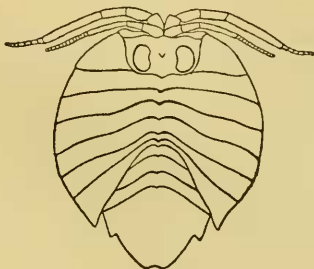
Family VIII. Serolidæ.

16. SEROLIS, Leach.

34. *Serolis carinata*, Lockington.

Serolis carinata, Lockington, Proc. Cal. Acad. Sci. vii. 1877, pt. i. p. 36.

Fig. 19.



Serolis carinata, Lockington. $\times 8$.

Hab. San Diego, California.

[To be continued.]